



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

M-89-107

Date: November 7, 1989

In reply refer to: M-89-107 through -110

Mr. Ed McGhee
Executive Vice President
International Association
of Drilling Contractors
Post Office Box 4287
Houston, Texas 77210-4287

At 1605 on December 15, 1988, the 297-foot-long U.S. mobile offshore drilling unit ROWAN GORILLA I capsized and sank in the North Atlantic Ocean about 500 nautical miles southeast of Halifax, Nova Scotia, Canada. The ROWAN GORILLA I, a self-elevating type drilling rig, was being towed by the 245-foot-long Bahamian tug SMIT LONDON from Halifax to Great Yarmouth, United Kingdom when the towline broke about 0220 on December 15, during a severe storm. At 1340 on December 15, the 27 persons aboard the ROWAN GORILLA I abandoned the rig using one of the rig's survival capsules. When the rig was abandoned, there were 50-foot-high seas and the wind was blowing at about 60 knots. About 1200 on December 16, when the seas had subsided to about 15 feet in height, the 27 persons were rescued from the survival capsule by the SMIT LONDON crew. The estimated value of the rig was \$90 million.¹

For the ROWAN GORILLA I to capsize on December 15, 1988, either the rig did not have sufficient intact stability for the environmental conditions or its stability was reduced by flooding below a level capable of withstanding the overturning forces of the wind and seas. However, once the rig capsized, it would only be a matter of minutes before it sank as the result of flooding of internal compartments through ventilation openings on the main deck. To determine the cause of capsizing, the Safety Board requested that the Marathon LeTourneau Offshore Company, the designers and builders of the ROWAN GORILLA I, perform stability calculations representing the vessel and environmental conditions at the time of the capsizing. In addition, the Safety Board examined several sources of flooding before capsizing including hull structural failures, flooding through ventilation openings on the main deck, and flooding as the result of damage on the rig's main deck from loose cargo.

¹For more detailed information, read Marine Accident Report--"Capsizing and Sinking of the U.S. Mobile Offshore Drilling Unit ROWAN GORILLA I in the North Atlantic Ocean, December 15, 1988" (NTSB/MAR-89/06).

With its legs in the severe storm condition 25 feet below the hull, as they were at the time of capsizing, the intact ROWAN GORILLA I was designed to have sufficient stability to withstand the overturning forces imposed by a sustained wind of 100 knots during severe storm conditions provided that the rig was loaded properly. In addition, the rig was designed to withstand the overturning forces imposed by a sustained wind of 50 knots with any one compartment or tank, located within 5 feet of the exterior hull, flooded. Based on meteorological information from the rig, the tug, other vessels in the area, the National Weather Service and other meteorological sources, the Safety Board estimated that the maximum sustained wind speed at the time of capsizing to be about 60 knots. Thus, the wind speed at the time of capsize was well below the design maximum speed of 100 knots for the intact rig, but in excess of design maximum speed of 50 knots for the rig with one compartment flooded. However, the stability calculations performed by Marathon after the accident indicate that as loaded on December 15, 1988, and with both preload tanks 14 and 15 flooded, the ROWAN GORILLA I's righting moment was several times greater than the overturning moment from a 60-knot wind, and the rig would have almost no stern trim. Therefore, the Safety Board believes that the ROWAN GORILLA I, as loaded on December 15, 1988, had sufficient stability to withstand the overturning moment of the wind even with preload tanks 14 and 15 flooded.

The Safety Board next considered how much flooding would be required to reduce the rig's stability below a level at which a 60-knot wind could capsize the ROWAN GORILLA I. The rig crew testified that in addition to the water entering preload tanks 14 and 15 through hull cracks, water was entering both propulsion rooms through cracks on the main deck, water was entering the air compressor room through an opening in the main deck, and the mud pit room was flooding through an opening on the main deck whose hatch cover had been torn off by the loose container. In addition, the Safety Board assumed that water was being trapped in the shale shaker house on the rig's stern because the house was open near the top for ventilation but otherwise constructed of corrugated steel plating. The stability calculations performed by Marathon showed that with water in all the above tanks and compartments, the ROWAN GORILLA I's righting moment would still be about twice the overturning moment due to the 60-knot wind and the stern trim would be about 2° to 3° . Thus, the Safety Board does not believe that the ROWAN GORILLA I would have capsized from water in preload tanks 14 and 15, the propulsion rooms, the air compressor room, the mud pit room and the shale shaker house.

About 0900 on December 15, the rig superintendent stated that the stern trim had increased from about 2° to 6° although all the equipment on deck, except for the containers which had broken loose earlier, was still in place. The Safety Board estimated that it would take a 5° to 6° stern trim for the after edge of the main deck of the ROWAN GORILLA I to be under water in still water. Therefore, with a 6° stern trim, the rig's after deck was now almost constantly under water. The barge engineer stated that although the crew was dewatering preload tanks 14 and 15, the stern trim continued to increase indicating to him that other after tanks must be flooding. Since both the rig superintendent and the barge engineer stated that up to the time the crew abandoned the rig, the crew was able to pump out the internal compartments as

fast as the water entered the compartments, the Safety Board believes that additional after preload tanks had to be flooding to cause the 6° stern trim.

Because the ventilation openings for the after preload tanks were only about 30 inches above the main deck which was about 10 feet above the mean water level with a 2° stern trim, and about 50-foot-high waves were breaking over the rig's stern, it is probable that the after preload tanks were taking on water through their ventilation openings. It is also possible that hull structural failures had occurred in additional after preload tanks resulting in their flooding. Another possible cause of flooding of after preload tanks was flooding through their 30-inch-high access hatches. The crew reported that on December 14, they had found some access hatch covers loose and had attempted to tighten all hatch covers, but could not reach those hatch covers near the stern because of the waves breaking on deck. Because the rig sank in about 16,000 feet of water and there are no plans to salvage the rig, the Safety Board was not able to examine the hull of the ROWAN GORILLA I after the sinking to determine what caused the flooding of after preload tanks. The Safety Board believes that the flooding of after preload tanks was probably due to a combination of hull structural failures, loose access hatch covers, and ventilation openings.

Once the after trim reached 6°, the after main deck would be constantly under water and the ROWAN GORILLA I would rapidly lose stability. In addition, other empty tanks and compartments would begin taking on water through ventilation openings as the after main deck sank deeper into the water. When the stern trim reached 12° just before the crew abandoned the rig, probably the entire main deck aft of the deckhouse was under water and all internal compartments and tanks in this area were taking on water through their main deck ventilation openings. Thus, as tanks and compartments flooded, the ROWAN GORILLA I slowly lost stability, the overturning forces of the wind and waves exceeded the righting ability of the rig, and it capsized.

There were numerous items stored on the main deck of the ROWAN GORILLA I during the tow including seven containers. Despite 50-foot-high waves breaking on deck, the only deck cargo reported broken loose were several of the containers. Based on the testimony of the ROWAN GORILLA I crew, the SMIT LONDON crewmember aboard the rig, the Rowan personnel responsible for preparing the rig for the tow in Halifax, and the survey report prepared for the tow by the surveying company, the Safety Board believes that all deck cargo was secured in accordance with good marine practice. The containers that broke loose had been placed in a protected location near the center of the main deck and were secured by angle irons placed on the four corners of the containers and welded on three sides to the deck and three sides to the container. The Safety Board believes that the force of the waves breaking over the stern on December 15, was greater than normal securing procedures could be expected to withstand. However, both the ROWAN GORILLA I and the

DAN PRINCE² accidents show the potential hazard of carrying deck cargo on self-elevating MODUs during ocean tows. Deck cargo also broke loose on the DAN PRINCE causing damage on its main deck that resulted in flooding of internal compartments and tanks. The Safety Board believes that the amount of deck cargo stowed on the main deck of self-elevating MODUs during ocean tows should be minimized.

According to the stability calculations performed by the ROWAN GORILLA I barge engineers on December 8, 1988, the rig departed Halifax with all the preload tanks nearly empty except for 2 or 3 inches of water and the main deck about 14 feet above the mean water level. The vents for the preload tanks were located about 30 inches above the main deck and were designed to minimize water from entering the tanks through the vents. The purpose of these vents was to prevent over pressurization or implosion during filling or discharge. However, the rig preload tanks were located around the periphery of the hull where boarding seas during a storm could easily reach the opening to their vents. The Safety Board believes that because the preload tanks were not being used during the voyage and they were all nearly empty, their vents should have been made watertight for the tow to prevent entry of any water into the tanks.

The U.S. Coast Guard Certificate of Inspection for the ROWAN GORILLA I required that the rig be equipped with four survival capsules with a total capacity for 172 persons. Two of the capsules were required to be stowed on the port side and two on the starboard side. Additionally, the certificate of inspection required that the rig carry four inflatable liferafts with a total capacity for 100 persons. U.S. Coast Guard regulations required that the survival capsules and the liferafts be stowed in their U.S. Coast Guard approved launching equipment at all times and that the rig superintendent ensure that each item of lifesaving equipment was maintained in operative condition. However, contrary to these U.S. Coast Guard requirements, the Rowan alternate rig superintendent, under instructions from Rowan shoreside managers, removed the rig's four survival capsules and four inflatable liferafts from their U.S. Coast Guard approved launching equipment while preparing the rig for its tow across the North Atlantic Ocean. Rowan managers stated that the reason for removing the survival capsules and liferafts from their approved launching equipment was to protect the survival equipment from being washed overboard during the tow. The Rowan vice president was not aware of any Rowan policies regarding the stowage of U.S. Coast Guard required lifesaving equipment during ocean tows, and the ROWAN GORILLA I operations manual did not address the stowage of lifesaving equipment during ocean tows.

Fortuitously, Canadian Coast Guard inspectors boarded the ROWAN GORILLA I before the rig left Halifax and told the alternate rig superintendent that the survival capsules should not have been removed without U.S. Coast Guard

²Republic of Liberia--"Decision of the Commissioner of Maritime Affairs, R.L. and Report of the Preliminary Investigation In the Matter of the Loss of the Jack-Up Drilling Rig DAN PRINCE (O.N. 6178) which Sank in Alaskan Waters on 22 October 1980," 18 May 1981, Monrovia, Liberia.

approval. As a result, the two 36-person survival capsules were replaced in their launching equipment. Because there were only 27 persons on board the rig, the two 36-person survival capsules were probably sufficient for safety. However, Rowan managers never contacted the U.S. Coast Guard for permission to remove any of the survival capsules or liferafts from their launching equipment and none of the liferafts was replaced in approved launching equipment.

The Safety Board believes that the location of the ROWAN GORILLA I launching equipment for liferafts was inappropriate for an ocean tow. If the rig's liferafts had remained in their launching equipment on top of the rails near the edge of the main deck for the ocean tow, the hydrostatic releases for the liferafts would probably been activated and the liferafts would have been washed overboard during the severe storms encountered during the tow. The Safety Board believes that for the ocean tow, Rowan should have provided alternate U.S. Coast Guard approved liferaft launching equipment in locations on the ROWAN GORILLA I that would be protected from waves during severe weather. In addition, the Safety Board believes that Rowan should have provided explicit instructions in the rig's operations manual regarding the proper stowage of lifesaving equipment during ocean tows. Had the ROWAN GORILLA I proceeded to sea without any of its survival capsules or liferafts in their approved launching equipment, the Safety Board believes that there may have been serious injuries and loss of life when the rig capsized and sank on December 15, 1988, because the crew would not have been able to launch the survival capsules and liferafts. Although the crew's immersion suits would have provided them with thermal protection, they may not have been able to swim away from the rig before the rig capsized on top of them. If any of the crew were able to escape the sinking rig, they would probably have become separated in the high seas and darkness, and may not have been found by rescue aircraft or the SMIT LONDON. The Safety Board believes that the U.S. Coast Guard should examine the location of liferaft launching equipment on all U.S. self-elevating MODUs to ensure that the liferafts are protected from being washed overboard during storms while the rig is being towed. It may be necessary to require alternate liferaft launching equipment for ocean tows.

The Safety Board is also concerned that the U.S. MODU industry does not put sufficient emphasis on maintaining lifesaving equipment operational. During its investigation of the capsizing and sinking of the ODECO owned OCEAN RANGER³ off the east coast of Canada in 1982, the Safety Board found that two of the four U.S. Coast Guard required covered lifeboats did not meet U.S. Coast Guard standards. One of the two U.S. Coast Guard approved covered lifeboats was operational and the other was lashed on deck. In addition, the OCEAN RANGER did not have the davit-launched liferafts required by the U.S. Coast Guard. The Safety Board could not determine if ODECO's failure to comply with U.S. Coast Guard lifesaving equipment requirements contributed to

³Marine Accident Report--Capsizing and Sinking of the U.S. Mobile Offshore Drilling Unit OCEAN RANGER Off the East Coast of Canada, 166 Nautical Miles East of St. John's, Newfoundland, February 15, 1982" (NTSB/MAR-83-2).

the loss of life on the OCEAN RANGER; however, the lack of compliance decreased the usable lifeboat and liferaft capacity. The Safety Board believes that there is a need for the International Association of Drilling Contractors (IADC) to put more emphasis on maintaining required lifesaving equipment operational at all times.

Therefore, the National Transportation Safety Board recommends that the International Association of Drilling Contractors:

Publicize the circumstances of this accident to members through industry publications. (Class II, Priority Action) (M-89-107)

Emphasize to members the need for maintaining required lifesaving equipment operational at all times. (Class II, Priority Action) (M-89-108)

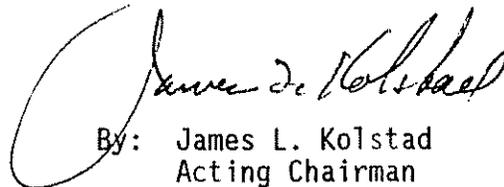
Recommend that members minimize the amount of deck cargo carried on self-elevating mobile offshore drilling units during ocean tows. (Class II, Priority Action) (M-89-109)

Recommend that members make ventilation openings for empty tanks watertight when towing self-elevating mobile offshore drilling units on routes where severe weather can be expected. (Class II, Priority Action) (M-89-110)

The National Transportation Safety Board is an independent Federal agency with the statutory responsibility "... to promote transportation safety by conducting independent accident investigations and by formulating safety improvement recommendations" (Public Law 93-633). The Safety Board is vitally interested in any action taken as a result of its safety recommendations. Therefore, it would appreciate a response from you regarding action taken or contemplated with respect to the recommendations in this letter. Please refer to Safety Recommendations M-89-107 through -110 in your reply.

Also, the Safety Board issued Safety Recommendations M-89-88 through -96 to the U.S. Coast Guard; M-89-97 through -104 to Rowan Companies, Inc.; M-89-105 to the American Bureau of Shipping; and M-89-106 to Marathon LeTourneau Offshore Company. The Safety Board also reiterated Safety Recommendations M-83-8 through -10 and M-87-32 to the U.S. Coast Guard and M-84-48 to the Secretary of the U.S. Department of Transportation.

KOLSTAD, Acting Chairman, and BURNETT, NALL and DICKINSON, Members, concurred in these recommendations. LAUBER, Member, did not participate.



By: James L. Kolstad
Acting Chairman